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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/613,065	07/07/2003	Michio Asahina	101590.02	8562

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OLIFF & BERRIDGE, PLC
P.O. BOX 19928
ALEXANDRIA, VA 22320

EXAMINER	
HOGANS, DAVID L	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 06/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/613,065	ASAHINA ET AL.	
	Examiner	Art Unit	
	David L. Hogans	2813	

-- Th MAILING DATE of this communication app ars on the cover sheet with th corr spondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/161,920.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7-07-03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the Transmittal of New Application filed on July 7, 2003.

Status of Claims

Claims 1-8 are pending.

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 09/161,920, filed on Septemeber 29, 1998.

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on July 7, 2003, is in compliance with the provisions of 37 CFR 1.97, and accordingly, has been considered by the examiner.

Specification

2. The amendment filed July 7, 2003, is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: page 26 line 7, states: "The wetting layer may also include zirconium.".

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1 and 2 recite the limitation "the surface" in lines 10 and 11, respectively. The Examiner notes that "the surface" can refer to any surface (i.e.- a top, bottom or side surface). Consequently, the Examiner is uncertain as to which surface "the surface" is.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over 6,309,971 to Geha in view of 6,002,175 to Maekawa further in view of 6,077,782 to Hsu et al.

Claim 1

Geha teaches a method of fabricating a semiconductor device comprising a semiconductor substrate including semiconductor elements, and multi-layered wiring regions, wherein at least one layer of the wiring regions above the first wiring region on the semiconductor substrate is fabricated using a process comprising the following steps: (a) a step of forming a via-hole in an interlayer dielectric formed above the first

wiring region on a semiconductor substrate; (b) a degassing step for removing gaseous components included within said interlayer dielectric; (c) a step of forming a wetting layer on the surface of said interlayer dielectric (d) a step of cooling the substrate to a temperature of no more than 100°C (noting that conventional wetting layers are deposited at temperatures in excess of 200°C and that the first aluminum deposition step may occur at 40°C) ; (e) a step of forming a first aluminum layer comprising one of aluminum and an alloy in which aluminum is the main component on said wetting layer at a temperature of a first degree C; (f) a step of forming a second aluminum layer comprising one of aluminum and an alloy in which aluminum is the main component on said first aluminum layer at a temperature of a second degree C; and wherein the first degree C is lower than the second degree C. (See Figures 2-8 and columns 6-11 lines 10-64)

Geha fails to explicitly teach forming a wetting layer on said dielectric and a degassing step via a heat treatment under reduced pressure and at the substrate temperature of 300°C to 550°C.

However, Maekawa, in column 7 lines 01-10, teaches a degassing step for removing gaseous components included within an interlayer dielectric by a heat treatment under reduced pressure and at the substrate temperature of 300°C to 550°C. Furthermore, Hsu et al., in Figure 2, teaches forming a wetting layer on said dielectric.

It would have been obvious to one of ordinary skill in the art to modify Geha by incorporating a degassing step for removing gaseous components included within an interlayer dielectric by a heat treatment under reduced pressure and at the substrate temperature of 300^{O}C to 550^{O}C, as taught by Maekawa, to remove water, nitrogen, hydrogen or other organic substances that may contaminate the adhesive interface with an overlying layer. Finally, it would have been obvious to one of ordinary skill in the art to modify Geha by incorporating forming a wetting layer on said dielectric, as taught by Hsu et al., to prevent the migration of silicon atoms into the aluminum layer.

Furthermore, the specification contains no disclosure of either the critical nature of the claimed process conditions (i.e. – specific temperature or pressures of degassing) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the Applicant must show that the chosen limitations are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)

Finally, it would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the degassing conditions, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233 (CCPA 1955)

Claim 2

Geha teaches a method of fabricating a semiconductor device comprising a semiconductor substrate including semiconductor elements, and multi-layered wiring regions, wherein at least one layer of the wiring regions above the first wiring region on the semiconductor substrate is fabricated using a process comprising the following steps: (a) a step of forming an interlayer dielectric formed above the first wiring region on a semiconductor substrate; (b) a degassing step for removing gaseous components included within said interlayer dielectric; (c) a step of forming a wetting layer on the surface of said interlayer dielectric (d) a step of cooling the substrate to a temperature of no more than 100°C (noting that conventional wetting layers are deposited at temperatures in excess of 200°C and that the first aluminum deposition step may occur at 40°C); (e) a step of forming a first aluminum layer comprising one of aluminum and an alloy in which aluminum is the main component on said wetting layer at a temperature of a first degree C; (f) a step of forming a second aluminum layer comprising one of aluminum and an alloy in which aluminum is the main component on said first aluminum layer at a temperature of a second degree C; and wherein the first degree C is lower than the second degree C. (See Figures 2-8 and columns 6-11 lines 10-64)

Geha fails to explicitly teach forming a wetting layer on said dielectric and a degassing step via a heat treatment under reduced pressure and at the substrate temperature of 300°C to 550°C.

However, Maekawa, in column 7 lines 01-10, teaches a degassing step for removing gaseous components included within an interlayer dielectric by a heat treatment under reduced pressure and at the substrate temperature of 300°C to 550°C. Furthermore, Hsu et al., in Figure 2, teaches forming a wetting layer on said dielectric.

It would have been obvious to one of ordinary skill in the art to modify Geha by incorporating a degassing step for removing gaseous components included within an interlayer dielectric by a heat treatment under reduced pressure and at the substrate temperature of 300°C to 550°C, as taught by Maekawa, to remove water, nitrogen, hydrogen or other organic substances that may contaminate the adhesive interface with an overlying layer. Finally, it would have been obvious to one of ordinary skill in the art to modify Geha by incorporating forming a wetting layer on said dielectric, as taught by Hsu et al., to prevent the migration of silicon atoms into the aluminum layer.

Furthermore, the specification contains no disclosure of either the critical nature of the claimed process conditions (i.e. – specific temperature or pressures of degassing) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the Applicant must show that the chosen limitations are critical. *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)

Finally, it would have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the degassing conditions, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233 (CCPA 1955)

Claim 3

Incorporating all arguments of Claim 1 and noting that Geha teaches wherein the first degree C is no more than 200°C and the second degree C is at least 300°C. (See Figures 2-8 and columns 6-11 lines 10-64)

Claim 4

Incorporating all arguments of Claim 2 and noting that Geha teaches wherein the first degree C is no more than 200°C and the second degree C is at least 300°C. (See Figures 2-8 and columns 6-11 lines 10-64)

Claim 5

Incorporating all arguments of Claim 1 and noting that Geha teaches wherein the formation of the aluminum layers in said steps (e) and (f) is provided by sputtering. (See Figures 2-8 and columns 6-11 lines 10-64)

Claim 6

Incorporating all arguments of Claims 1 and 3 and noting that Geha teaches wherein the formation of the aluminum layers in said steps (e) and (f) is provided in the same chamber and in a consecutive manner. (See Figures 2-8 and columns 6-11 lines 10-64)

Claim 7

Incorporating all arguments of Claims 1 and 3 and noting that Geha and Maekawa fail to explicitly teach wherein steps (d), (e) and (f) are performed consecutively in the same equipment having a plurality of chambers each maintained under a reduced pressure.

However, Hsu et al., in Figures 1-3 and column 4 lines 17-38, teaches wherein steps (d), (e) and (f) are performed consecutively in the same equipment having a plurality of chambers each maintained under a reduced pressure.

It would have been obvious to one of ordinary skill in the art to modify Geha and Maekawa by incorporating wherein steps (d), (e) and (f) are performed consecutively in the same equipment having a plurality of chambers each maintained under a reduced pressure, as taught by Hsu et al., to process the device in a cluster load lock tool wherein the vacuum integrity is maintained throughout the entire fabrication process to prevent reoxidation of surfaces.

Claim 8

Incorporating all arguments of Claims 1 and 3 and noting that Geha teaches wherein the formation of the aluminum layers in said steps (e) and (f) is provided by controlling the temperature of the stage (106) on which said semiconductor substrate (101) is to be mounted. (See Figures 1-8 and columns 4-11 lines 60-64)

Double Patenting

7. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

8. Claims 1-8 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-5 of U.S. Patent No. 6,107,182 to Asahina et al. Although the conflicting claims are not identical, they are not patentably distinct from each other because the species claimed in the conflicting patent anticipates the claimed genus in the present application being examined and a patent to the genus would therefore extend the right of the species, should the genus issue as a patent after the species. (See MPEP 804, 806.04(d) and 806.04(i))

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David L. Hogans whose telephone number is (571) 272-1691. The examiner can normally be reached on M-F (7:30-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DH

Craig a. Thompson

CRAIG A. THOMPSON
PRIMARY EXAMINER